2014 Water Quality Assessment Submittal to EPA
4b Analysis for Yellowjacket Creek
September 2015

The Washington Department of Ecology (Ecology) Integrated Report (IR) proposes to exclude three listings (19866, 19868, 19869) for temperature on Yellowjacket Creek from the 303(d) list and placed these water bodies in category 4b of the IR. Listing 19866 was listed in category 5 of the 2008 IR. Listings 19868 and 19869 were in category 4b. Ecology's basis for excluding these water bodies from the 303(d) list is outlined in this evaluation.

Identification of Segment and Statement of Problem Causing Impairment

Yellowjacket Creek is one of eight subwatersheds within the Lower Cispus River watershed. The 15.5 mile creek flows northerly from its headwaters at 4,276 feet above mean sea level to its confluence (1,259 feet above mean seal level) with the Cispus River at river mile 17.2. The mean stream gradient is 3.7%, calculated from digitized 7.5-minute topographic maps.

Yellowjacket Creek is one of three subwatersheds having the warmest waters flowing into the Cispus River, and maximum daily temperatures exceed 16ºC for prolonged periods during the summer. Only the lowest 1.5 river miles of Yellowjacket Creek consistently have prolonged periods during the summer with elevated stream temperatures. This stream reach comprises the lowest mile and a half of the 6.1 anadromous habitat miles of Yellowjacket Creek.

McCoy Creek, the largest tributary to Yellowjacket Creek, exceeded a 7-day average maximum temperature of 16ºC only one year (2009) of the seven years monitored. An anadromous fish barrier falls exists at the base of the McCoy Creek subwatershed. Pinto Creek, the next largest tributary to Yellowjacket Creek, 7-day maximum stream temperature did not exceeded 16ºC during the years monitored and flows into Yellowjacket Creek above its anadromous fish barrier falls. Pumice Creek, a tributary to Pinto Creek, exceeded 16ºC two of the eight years years monitored. No other streams have been identified as a source of heat pollutant or are considered to be a significant source of heated water affecting Yellowjacket Creek water temperatures.

Stream Name	Monitoring location	Maximum 7-day average temperature in 2014 (ºC)	Years monitored	Years temperature exceeded Maximum 7-day average of 16.0ºC (#)	Highest Maximum 7-day average temperature (ºC) during monitoring period (Year)
Pumice Creek	At confluence with Pinto Creek	*	2001-2005, 2007, 2009-2010	2	16.6 (2009)

Stream Name	Monitoring location	Maximum 7-day average temperature in 2014 (ºC)	Years monitored	Years temperature exceeded Maximum 7-day average of 16.0ºC (#)	Highest Maximum 7-day average temperature (ºC) during monitoring period (Year)
Pinto Creek	At confluence with Yellowjacket Creek	*	2001-2003	0	15.2 (2001)
Yellowjacket Creek	Above McCoy Creek	15.7	2001, 2003-2010, 2012-2014	3	16.9 (2009)
McCoy Creek	At Confluence with Yellowjacket Creek	15.0	2001, 2009-2014	1	16.6 (2009)
Yellowjacket Creek	At confluence with Cispus River	**18.3**	1996, 1999-2014	11	19.9 (2009)
Cispus River	Above North Fork Cispus River	**14.6**	1994,2000, 2003-2011, 2013-2014	2	16.8 (2005)
Cispus River	Above Yellowjacket Creek	**16.3**	2000, 2011-2014	2	16.3 (2014)
Cispus River	Below Greenhorn Creek	**17.7**	2000, 2004, 2009-2014	6	18.4 (2009)
Cispus River	Below Iron Creek	**17.3**	1999-2014	13	18.5 (2009)

Listings 19868 and 19869 are for the two lowest segments in Yellowjacket Creek, just above the confluence with the Cispus River. Listing 19866 is for a segment further upstream that extends from the outlet stream from Black Rock Lake upstream to where McCoy Creek enters Yellowjacket Creek.

The four human caused sources that have altered natural processes and contributed to increased temperatures are:

1. reduced riparian shade;
2. degraded channel conditions (widened and shallowed);
3. increased sediment load to the stream channel; and
4. to a lesser extent, increased drainage network as a result of road building and associated roadside ditches.

Timber harvest of riparian forest areas that occurred in the mid to late 1900s removed shade-producing trees. Increased channel width resulted from removal of large instream wood, and from landslides (natural and human induced) and road related sediment. Flood damage in 1996 is the primary cause of more recent road related erosion and culvert failure in Yellowjacket Creek, although previous floods have resulted in similar episodes of accelerated sedimentation to the lower reaches of Yellowjacket Creek. Increased drainage network from high road density also contributed to stream widening, but to a lesser extent than the sediment contributed from failed roads and landslides.

Description of Pollution Controls and How They Will Achieve Water Quality Standards

The designated use for the temperature impaired segments of Yellowjacket Creek is core summer salmonid habitat, and the temperature criterion is 16 degrees centigrade, year-round. In addition, the segments have a supplemental spawning criterion of 13 degrees centigrade from February 15 to June 15.

Most riparian areas in the watershed will be restored by passive restoration, which means letting the areas recover on their own. This process can take 100 years or more. In addition, the Forest Service has implemented some active riparian restoration projects, which generally involve thinning riparian stands to encourage the remaining trees to grow faster and therefore provide more shade sooner. Stream temperatures in the smaller tributaries in the upper watershed should improve within the next five to ten years as vegetation grows and streambank stability increases (barring any additional natural disturbances or extreme climatic trends). Stream temperatures in the lowest reaches of the Yellowjacket Creek watershed will take longer to show improvement because the stream has widened and shallowed from excessive sediment inputs. In this area, lowered stream temperatures will depend as much on the stream recovering its natural geometry and stability as on restoring riparian shade.

Work that the Forest Service has done and plans to do to address road related sediment problems will also help to solve the temperature impairments in Yellowjacket Creek. The stream has widened and shallowed because of human caused sedimentation, and as roads are repaired, decommissioned, and routinely maintained, the sediment load to streams will decrease.

However, stream recovery takes time even when sediment delivery is decreased. Streams may take a decade or more to move past excessive sediment loads, and the amount of time this takes depends on the magnitude of flow events that occur. Consequently, stream widths may narrow temporarily and then widen again after a flow event that is large enough to move some of the excessive sediment load stored within the streams. As channel stability improves through time, other restoration treatments, such as placement of large wood in the channel, will become more viable.

It is anticipated that with the completion of identified high priority work, episodic inputs of accelerated sediment from roads, undersized or aging culverts, and bank instability will be decreased from the channel condition imprints observed historically. The overall effectiveness of these treatments should become evident by increased watershed stability in response to future flood events. Monitoring of BMP effectiveness and periodic aerial photo interpretation would help define recovery trends and timeframes.

Estimate or Projection of Time When Water Quality Standards Will be Met

Waters in Yellowjacket Creek will continue to violate temperature standards until excess sediment has worked its way out of the system and streams have recovered their natural geometry and the riparian areas have recovered. Given the time it takes for natural systems to recover, Ecology estimates that it will take 40 years for Yellowjacket Creek to meet the temperature standard.

Schedule for Implementing Pollution Controls

The table below shows active restoration projects implemented since 2008.

Objective	Active Restoration	Project details
Restore shade to limit solar radiation to streams	Active silviculture treatments including conifer planting and underplanting, select tree enhancement, riparian thinning to increase stand height and vigor, and young conifers release from overtopping hardwoods	*Precommercial thin* **114 riparian acres**
Restore channel integrity so that channel form allows fish passage	Improve road/stream crossings so that fish passage occurs for all species all life stages	**Bridge across Yellowjacket Creek constructed in 2010**
Limit road related runoff so that channel form can be maintained	Road Decommission	**FY13 – 1.5 miles** **FY14 – 1.7 miles**
Limit Road Related Sediment Delivery	Road maintenance to minimize road related sediment and minimize disruption to flow patterns	**FY 08 – 10 miles**[1] **FY 09 – 10 miles**[1]

1 Road maintenance accomplished but not on priority roads listed in the WQRP.

The Cowlitz Indian Tribe secured funding in 2014 from a Lower Columbia Fish Recovery Board grant to increase long-term habitat stability for steelhead and salmon in the lowest mile of Yellowjacket Creek and connecting reaches of the Cispus River. The objectives include increasing longevity of point bars and associated vegetation, enhancing margin habitat through placement of in-stream wood structures on the mainstem and side channels, encouraging a forested island network, and improving floodplain forest conditions. The Cowlitz Indian Tribe has contracted with Natural Systems Design, Inc. to get a preliminary design by spring of 2015.

Monitoring Plan to Track Effectiveness of Pollution Controls

Long term temperature monitoring sites have been established along Yellowjacket Creek at RM 0.1 and 4.7 and on McCoy Creek just above its confluence with Yellowjacket Creek (Figure 1). Yellowjacket Creek at RM 1.5 is a transition point onto a wide flat floodplain (alluvial deposition) and will be monitored annually in the future to determine if stream temperatures remain below the state standard during most years at that reach prior to flowing into the wide floodplain.

Summer stream temperatures in Yellowjacket Creek during years with high snow packs on the preceding April 1 (1999, 2002, 2008 and 20011) were cooler and this tendency is apparent in the other subwatersheds that flow into the Cispus River and in the Cispus River itself (Figure 2). Summer 2012 stream temperatures did not remain as cool with similar April 1 snowpack and summer 20111.

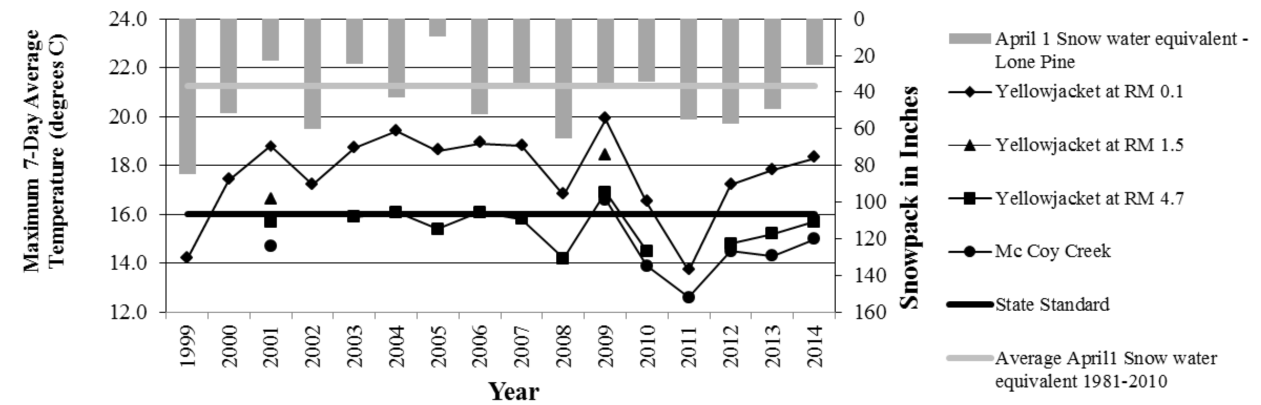

Figure 1

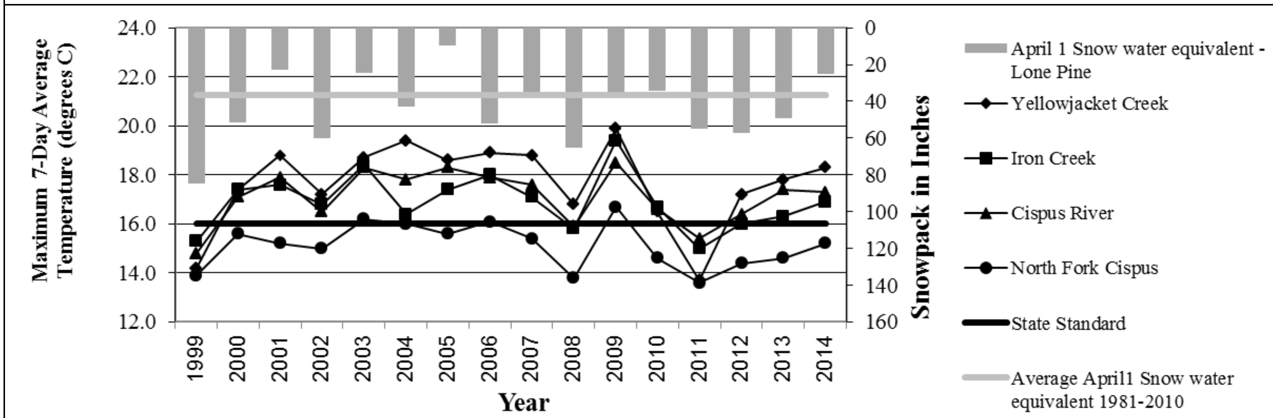

Figure 2

Individual projects were monitored with various objectives. The Yellowjacket Creek Road Decommissioning Project was monitored to evaluate channel migration and down cutting of the newly re-established channel sections. Pre- and post-project photographs were taken. On Pinto Creek, a fish-bearing stream, detailed measurements of channel cross section and longitudinal profile were taken. Photo points and monuments have been established for future monitoring of the site. In addition, field review of the road decommissioning project is planned using the Gifford Pinchot National Forest Restoration Effectiveness Monitoring Protocol. The goal of effectiveness monitoring is to provide information that can be used to improve, alter or change various treatment techniques implemented in this road decommissioning project.

Commitment to Revise Pollution Controls as Necessary

The Gifford Pinchot National Forest is required under the Forest Plan for the forest, as amended by the Northwest forest Plan (NWFP), to adjust and adapt activities if monitoring demonstrates that goals and objectives of the plan are not being met. In addition, an interagency aquatic monitoring effort, Aquatic-Riparian Effectiveness Monitoring Protocol (AREMP) has been in place since the inception of the NWFP with requirements to evaluate the effectiveness of the NWFP aquatic conservation strategy, and address watershed condition trends across the NWFP area. The outcomes of AREMP will be critical in determining whether implementation is working and if additional management practices will be needed.

Ecology expects that implementation activities completed and planned in the Yellowjacket watershed will achieve compliance with state water quality standards. However, if they do not, Ecology will work with the Forest Service to determine other controls that could be used to achieve compliance.